BATTERY ENGAGEMENT STRUCTURE FOR PORTABLE BATTERY CHARGING MODULE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a portable battery charging module and, more specifically, to the battery engagement structure used in a portable battery charging module and adapted to lock a battery pack for charging.

2. Description of Related Art

The battery charging system of a portable computer is provided inside the mainframe, and adapted to charge the battery during the use of the AC power socket.

Following the development of high technology, improved battery charging modules are developed. A battery charging module generally comprises a battery engagement opening adapted to receive the battery pack to be charged, a battery engagement structure adapted to engage the battery pack to be charged for charging, and power input/output terminals. The power input terminal is connectable to external power source for charging.

The aforesaid battery engagement structure generally comprises a locking bar and a control button. The control button is operated to move the locking bar to the locking position to lock the inserted battery pack for charging. Because the moving direction of the locking bar in the battery charging module is same as the control button, pressing the control button causes the locking bar to move in the same direction. This design requires

much internal space to accommodate the control button and the locking bar and their movement. Further, the control button and the locking bar must be arranged in close proximity to each other to facilitate the action. Due to the aforesaid problem, the arrangement of the component parts of the portable battery charging module must consider the space for the operation of the battery engagement structure.

SUMMARY OF THE INVENTION

It is the main object of the present invention to provide a battery engagement structure, which requires less installation space in the portable battery charging module, for enabling the internal space of the portable battery charging module to be fully utilized.

To achieve this and other objects of the present invention, the battery engagement structure comprises a housing, a button, an operation mechanism, and a spring member. The housing comprises a bottom panel, a first side panel, and a second side panel, the first side panel having an inner face, the second side panel abutted against one end of the first side panel, a battery engagement opening disposed at the first side panel, a sliding groove disposed at the first side panel in parallel to the inner face of the first side panel, a button hole disposed at the second side panel, and a pivot holder upwardly extended from the bottom panel adjacent to the connection area between the first side panel and the second side panel. The button is mounted in the button hole. The operation mechanism comprises a locking bar and a link. The locking bar is mounted in the sliding groove and movable along the sliding groove in and out of the battery engagement

opening, having a front end insertable into the battery engagement opening. The link has a first end, a second end, and a middle part, the first end coupled to the locking bar, the second end stopped against the button, and the middle part pivoted to the pivot holder. The spring member is adapted to impart a prestress to the locking bar to force the front end of the locking bar inserted into the battery engagement opening.

When charging a battery pack, insert the battery pack into the battery engagement opening. At this time, the battery pack pushes the locking bar of the operation mechanism toward the inside of the housing, and at the same time, the spring member imparts a prestress to the locking bar, thereby causing the front end of the locking bar to be moved into the battery engagement opening to engage the battery pack, and therefore the battery pack is locked in the charging position.

After charging, press the button to pull the link to cause the locking bar outwards moving from the battery engagement opening toward the inside of the housing and to further unlock the battery pack, for enabling the battery pack to be removed from the engagement structure of the portable battery charging module.

As indicated above, when pressing the button, the locking bar outwards from the battery engagement opening in a direction reversed or inclined to the direction of the press motion of the button. Therefore, the invention fully utilizes the internal space of the portable battery charging module, eliminating the drawback of the prior art design in which the button and the locking member are arranged in close proximity to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing showing an application example of the present invention.

FIG. 2 is a perspective assembly view of the preferred embodiment of the present invention.

FIG. 3 is an exploded view of the preferred embodiment of the present invention.

FIG. 4 is a schematic operational view showing the button pressed, the locking bar moved away from the battery engagement opening according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a schematic drawing showing an application example of the present invention, in which the reference number **91** indicates a battery pack; the reference number **92** indicates an external power cable **92**; the reference number **93** indicates a tablet PC; the reference number **7** indicates a portable battery charging module. The portable battery charging module **7** comprises an engagement structure **6**. When in use, the battery pack **91** is connected to the tablet PC **93** to provide the tablet PC **93** with the necessary working voltage. When power low, the battery pack **91** is disconnected from the tablet PC **93**, and then connected to the portable battery charging module **7** for charging. At this time, the engagement structure **6** of the portable battery charging module **7** engages the battery pack **91**, for enabling the battery pack **91** to be charged by the internal charging circuit (not shown) of the portable battery charging module **7** with power obtained

from external power source through the external power cable **92**.

Referring to FIGS. 2 and 3, and FIG. 1 again, the engagement structure **6** comprises a housing **1**, a button **2**, an operation mechanism **3**, and a spring member **4**. The housing **1** is formed of a top cover shell **101** and a bottom shell **102**, having a bottom panel **10**, a first side panel **11**, and a second side panel **12**. The bottom panel **10** is formed in the bottom shell **102**. The first side panel **11** has a battery engagement opening **111**, an inner face **112**, a sliding groove **113** disposed in parallel to the inner face **112**, and two ribs **110** inwardly protruded from the inner face **112**. The sliding groove **113** is formed in the ribs **110**. The second side panel **12** is abutted against one end of the first side panel **11**, having a button hole **121** adapted to accommodate the button **2**. The housing **1** further comprises a pivot holder **13** upwardly extended from the bottom panel **10** adjacent to the connection area between the first side panel **11** and the second side panel **12**, and a guide rod **14** upwardly extended from the bottom panel **10** adjacent to the first side panel **11**.

As illustrated, the button **2** is mounted in the button hole **121**. The operation mechanism **3** is comprised of a locking bar **31**, and a link **32**. The locking bar **31** is slidably mounted in the sliding groove **113** inside the housing **1** in parallel to the first side panel **11**, having a front end **311** insertable into the battery engagement opening **111**, a supporting rod **33**, and an oblong guide hole **312**. The oblong guide hole **312** is coupled to the guide rod **14**. Further, the link **32** of the operation mechanism **3** has a middle part **321**, a first end **322**, and a second end **323**. The middle part **321** defines

a pivot hole **320**. A screw **5** is inserted through the pivot hole **320** and threaded into the pivot holder **13** to pivotally secure the link **32** to the pivot holder **13**, keeping the first end **322** of the link **32** movably coupled to the locking bar **31** and the second end **323** stopped at the button **2**.

Further, the spring member **4** has one end supported on the supporting rod **33** of the locking bar **31** and the other end stopped against one rib **110**, imparting a prepress to the locking bar **31** to force the front end **311** of the locking bar **31** inserted into the battery engagement opening **111**.

Referring to FIG. 4 and FIGS. 1 and 3 again, when charging the battery pack **91**, insert the battery pack **91** into the battery engagement opening **111**. At this time, the battery pack **91** pushes the locking bar **31** of the operation mechanism **3** toward the inside of the housing **1**, and at the same time, the spring member **4** imparts a prestress to the locking bar **31**, thereby causing the front end **311** of the locking bar **31** to be moved into the battery engagement opening **111** to engage the battery pack **91**, and therefore the battery pack **91** is locked in the charging position.

After charging, press the button **2**, as shown in FIG. 4, at this time the link **32** is turned about the pivot holder **13** to pull the locking bar **31** outwards from the battery engagement opening **111** in direction reversed to the direction of the press motion of the button **2** (see the moving direction indicated by the arrowhead signs in FIG. 4) and to further unlock the battery pack **91**, for enabling the battery pack **91** to be removed from the engagement structure **6** of the portable battery charging module **7**. During sliding action of the locking bar **31**, the oblong guide hole **312** and the guide

rod **14** guide the movement of the locking bar **31** in course.

As indicated above, when pressing the button **2**, the link **32** is turned about the pivot holder **13** to pull the locking bar **31** outwards from the battery engagement opening **111** in a direction different from the direction of the press motion of the button **2**. According to this embodiment, the operation mechanism **3** is so designed that the locking bar **31** is moved in direction reversed to the direction of the press motion of the button **2**. By means of angle or shape design of the link **32**, the operation mechanism **3** can be made to let the locking bar **31** move in an oblique direction upon pressing of the button **2** by the user. Therefore, proper arrangement of the button **2** and the locking bar **31** in the portable battery charging module **7** with the link **32** coupled between the button **2** and the locking bar **31** achieves quick engagement of a battery pack. Therefore, the invention fully utilizes the internal space of the portable battery charging module **7**, eliminating the drawback of the prior art design in which the button and the locking member are arranged in close proximity to each other.

Although the present invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.